

Claims

I claim:

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1. A multilayer packaging film having at least four layers arranged in sequence comprising:
- (1) a first layer comprising at least 50% by weight of a copolymer of propene, and at least one α -olefin selected from the group consisting of ethylene, butene-1, methylpentene-1, hexene-1, octene-1, decene-1 and mixtures thereof, said copolymer having a propene content of at least 60 wt. %, a Tm between about 100°C and about 145°C, a Mw/Mn of between 1 and 5, and n-hexane extractables of less than 5 wt. %;
- (2) second and fourth layers each comprising:
- (a) at least 10 wt. % of a first copolymer of ethylene and at least one C₄-C₈ α -olefin, said copolymer having a density of from 0.900 to 0.915 g/cm³ and a melt index of less than 2 dg/min.,
- (b) at least 10 wt. % of a second copolymer of ethylene with from 4 to 18 wt. % of a vinyl ester, alkyl acrylate, acrylic or methacrylic acid, and
- (c) from 0 to 60 wt. % of a third copolymer of ethylene and at least one C₃-C₈ α -olefin having a density less than 0.900 g/cm³ and a melting point less of between 65-98°C.; and
- (3) a third layer comprising at least 80% by weight of at least one copolymer of vinylidene chloride with from 2-20 wt. % (based on said copolymer) of vinyl chloride or methyl acrylate.
2. The film of claim 1 wherein the first layer comprises a propylene-ethylene copolymer.
3. The film of claim 1 wherein the first layer comprises at least 75% by weight propylene-ethylene copolymer.

4. The film of claim 1 wherein said propene content of the first layer copolymer is at least 80% based on the weight of the copolymer.

5. The film of claim 1 wherein said propene content of the first layer copolymer is at least 90% based on the weight of the copolymer.

6. The film of claim 1 wherein the first layer consists essentially of propylene-ethylene copolymer.

7. The film of claim 1 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C.

8. The film of claim 1 wherein in the copolymer of the first layer the Tm is between about 120°C and 130°C.

9. The film of claim 1 wherein in the copolymer of the first layer the n-hexane extractables are less than 4 wt. %.

10. The film of claim 1 wherein in the copolymer of the first layer the n-hexane extractables are less than 2.6 wt. %.

11. The film of claim 1 wherein in the copolymer of the first layer the n-hexane extractables are less than 2 wt. %.

12. The film of claim 1 wherein in the copolymer of the first layer the n-hexane extractables are less than 1 wt. %.

13. The film of claim 1 wherein in the copolymer of the first layer the Mw/Mn is less than 3.

14. The film of claim 1 wherein in the copolymer of the first layer the Mw/Mn is between 1.5 and 2.5.

15. The film of claim 1 wherein in the copolymer of the first layer the Mw/Mn is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

16. The film of claim 1 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C, and the n-hexane extractables are less than 2.6 wt. %.

17. The film of claim 1 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C, and the Mw/Mn is less than 3.

18. The film of claim 1 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C, the Mw/Mn is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

19. The film of claim 18 wherein in the copolymer of the first layer the Mw/Mn is between 1.5 and 2.5.

~~20. The film of claim 18 wherein in the copolymer of the first layer the n-hexane extractables are less than 2 wt. %.~~

21. The film of claim 18 wherein in the copolymer of the first layer the n-hexane extractables are less than 1 wt. %.

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22. A multi-layer biaxially oriented heat-shrinkable packaging film comprising:

(1) a first layer comprising at least 50% by weight of a copolymer of propene, and at least one α -olefin selected from the group consisting of ethylene, butene-1, methylpentene-1, hexene-1, octene-1, decene-1 and mixtures thereof, said copolymer having a propene content of at least 60 wt. %, a Tm between about 100°C and about 145°C, a Mw/Mn of between 1 and 5, and n-hexane extractables of less than 4 wt. %;

(2) a second layer comprising:

(a) at least 10 wt. % of a first copolymer of ethylene and at least one C₄ - C₈ α -olefin, said copolymer having a density of from 0.900 to 0.915 g/cm³ and a melt index of less than 2 dg/min.,

(b) at least 10 wt. % of a second copolymer of ethylene with from 4 to 18 wt. % of a vinyl ester, alkyl acrylate, acrylic or methacrylic acid, and

(c) from 0 to 60 wt. % of a third copolymer of ethylene and at least one C₃ - C₈ α -olefin having a density less than 0.900 g/cm³ and a melting point less of between 85-98°C.; and

(3) a transition layer between and in contact with said first layer and said second layer, the transition layer comprising:

(a) at least 20% by weight of a fourth copolymer of propene, and at least one α -olefin selected from the group consisting of ethylene, butene-1, methylpentene-1, hexene-1, octene-1, decene-1 and mixtures thereof, said copolymer having a propene content of at least 60 wt. %, a Tm between 100°C and 145°C, a Mw/Mn of between 1 and 5, and n-hexane extractables of less than 4 wt. %;

(b) at least 20% by weight of a fifth copolymer of ethylene and at least one C₄ - C₈ α -olefin, said copolymer having a density of from 0.900 to 0.915 g/cm³ and a melt index of less than 2 dg/min., and

(c) from 0 to 60 wt. % of a sixth copolymer of ethylene and at least one C₃ - C₈ α -olefin having a density less than 0.900 g/cm³ and a melting point less of between 65-98°C.

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23. The film of claim 22 wherein the transition layer comprises at least 50 wt. % of either the fourth copolymer or the fifth copolymer.
24. The film of claim 22 wherein the transition layer comprises about 3% of the total thickness of the film.
25. The film of claim 22 wherein the first layer comprises a propylene-ethylene copolymer.
26. The film of claim 22 wherein the first layer comprises at least 75% by weight propylene-ethylene copolymer.
27. The film of claim 22 wherein said propene content of the first layer copolymer is at least 80% based on the weight of the copolymer.
28. The film of claim 22 wherein said propene content of the first layer copolymer is at least 90% based on the weight of the copolymer.
29. The film of claim 22 wherein the first layer consists essentially of propylene-ethylene copolymer.
30. The film of claim 22 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C.
31. The film of claim 22 wherein in the copolymer of the first layer the Tm is between about 120°C and 130°C.
32. The film of claim 22 wherein in the copolymer of the first layer the n-hexane extractables are less than 4 wt. %.
33. The film of claim 22 wherein in the copolymer of the first layer the n-hexane extractables are less than 2.6 wt. %.
34. The film of claim 22 wherein in the copolymer of the first layer the n-hexane extractables are less than 2 wt. %.

35. The film of claim 22 wherein in the copolymer of the first layer the n-hexane extractables are less than 1 wt. %.

36. The film of claim 22 wherein in the copolymer of the first layer the Mw/Mn is less than 3.

37. The film of claim 22 wherein in the copolymer of the first layer the Mw/Mn is between 1.5 and 2.5.

38. The film of claim 22 wherein in the copolymer of the first layer the Mw/Mn is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

39. The film of claim 22 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C, and the n-hexane extractables are less than 2.6 wt. %.

40. The film of claim 22 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C, and the Mw/Mn is less than 3.

41. The film of claim 22 wherein in the copolymer of the first layer the Tm is between about 110°C and 130°C, the Mw/Mn is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

42. The film of claim 41 wherein in the copolymer of the first layer the Mw/Mn is between 1.5 and 2.5.

43. The film of claim 41 wherein in the copolymer of the first layer the n-hexane extractables are less than 2 wt. %.

44. The film of claim 41 wherein in the copolymer of the first layer the n-hexane extractables are less than 1 wt. %.

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45. The film of claim 22 further comprising:
a third layer comprising:
at least 80% by weight of at least one copolymer of vinylidene
chloride with from 2-20 wt. % (based on said copolymer) of vinyl chloride
or methyl acrylate.
46. The film of claim 45 further comprising:
a fourth layer comprising:
(a) at least 10 wt. % of a seventh copolymer of ethylene and at
least one C₄ - C₈ α-olefin, said copolymer having a density of from 0.900 to
0.915 g/cm³ and a melt index of less than 2 dg/min.,
(b) at least 10 wt. % of a eighth copolymer of ethylene with
from 4 to 18 wt. % of a vinyl ester, alkyl acrylate, acrylic or methacrylic
acid, and
(c) from 0 to 60 wt. % of a ninth copolymer of ethylene and at
least one C₃ - C₈ α-olefin having a density less than 0.900 g/cm³ and a
melting point less of between 65-98°C.
47. The film of claim 46 wherein the layers are arranged in contact and
in the following sequence: first layer, transition layer, second layer, third layer and
fourth layer.

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~~48. A multilayer packaging film formable into a pouch by heat sealing for use in food preparation consisting essentially of:~~

(1) an inner sealing layer comprising at least 50% by weight of a copolymer of propene, and at least one α -olefin selected from the group consisting of ethylene, butene-1, methylpentene-1, hexene-1, octene-1, decene-1 and mixtures thereof, said copolymer having a propene content of at least 60 wt. %, a Tm between about 100°C and about 145°C, a Mw/Mn of between 1 and 5, and n-hexane extractables of less than 5 wt. %;

(2) a second layer in contact with the inner sealing layer comprising:

(a) at least 10 wt. % of a first copolymer of ethylene and at least one C₄ - C₈ α-olefin, said copolymer having a density of from 0.900 to 0.915 g/cm³ and a melt index of less than 2 dg/min.,

(b) at least 10 wt. % of a second copolymer of ethylene with from 4 to 18 wt. % of a vinyl ester, alkyl acrylate, acrylic or methacrylic acid, and

(c) from 0 to 60 wt. % of a fourth copolymer of ethylene and at least one C₃ - C₈ α-olefin having a density less than 0.900 g/cm³ and a melting point less of between 65-98°C.; and

(3) an optional third layer comprising a protective outer layer.

49. The film of claim 48 wherein the third layer comprises nylon.

50. The film of claim 48 wherein the third layer comprises at least 50% by weight of a copolymer of propene, and at least one α -olefin selected from the group consisting of ethylene, butene-1, methylpentene-1, hexene-1, octene-1, decene-1 and mixtures thereof, said copolymer having a propene content of at least 60 wt. %, a T_m between about 100°C and about 145°C, a M_w/M_n of between 1 and 5, and n-hexane extractables of less than 5 wt. %.

51. The film of claim 48 wherein in the copolymer of the inner sealing layer the T_m is between about 110°C and 130°C.

52. The film of claim 48 wherein in the copolymer of the inner sealing layer the T_m is between about 120°C and 130°C .

53. The film of claim 48 wherein in the copolymer of the inner sealing layer the n-hexane extractables are less than 4 wt. %.

54. The film of claim 48 wherein in the copolymer of the inner sealing layer the n-hexane extractables are less than 2.6 wt. %.

55. The film of claim 48 wherein in the copolymer of the inner sealing layer the n-hexane extractables are less than 2 wt. %.

56. The film of claim 48 wherein in the copolymer of the inner sealing layer the n-hexane extractables are less than 1 wt. %.

57. The film of claim 48 wherein in the copolymer of the inner sealing layer the M_w/M_n is less than 3.

58. The film of claim 48 wherein in the copolymer of the inner sealing layer the M_w/M_n is between 1.5 and 2.5.

59. The film of claim 48 wherein in the copolymer of the inner sealing layer the M_w/M_n is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

60. The film of claim 48 wherein in the copolymer of the inner sealing layer the T_m is between about 110°C and 130°C , and the n-hexane extractables are less than 2.6 wt. %.

61. The film of claim 48 wherein in the copolymer of the inner sealing layer the T_m is between about 110°C and 130°C , and the M_w/M_n is less than 3.

62. The film of claim 48 wherein in the copolymer of the inner sealing layer the T_m is between about 110°C and 130°C , the M_w/M_n is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

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P 63. The film of claim 62 wherein in the copolymer of the inner sealing layer the Mw/Mn is between 1.5 and 2.5.

64. The film of claim 62 wherein in the copolymer of the inner sealing layer the n-hexane extractables are less than 2 wt. %.

65. The film of claim 62 wherein in the copolymer of the inner sealing layer the n-hexane extractables are less than 1 wt. %.

66. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Tm is between about 110°C and 130°C.

67. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Tm is between about 120°C and 130°C.

68. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the n-hexane extractables are less than 4 wt. %.

69. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the n-hexane extractables are less than 2.6 wt. %.

70. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the n-hexane extractables are less than 2 wt. %.

71. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the n-hexane extractables are less than 1 wt. %.

72. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Mw/Mn is less than 3.

73. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Mw/Mn is between 1.5 and 2.5.

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74. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Mw/Mn is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

75. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Tm is between about 110°C and 130°C, and the n-hexane extractables are less than 2.6 wt. %.

76. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Tm is between about 110°C and 130°C, and the Mw/Mn is less than 3.

77. The film of claim 50 wherein in the copolymers of the inner sealing layer and the outer layer the Tm is between about 110°C and 130°C, the Mw/Mn is less than 3 and the n-hexane extractables are less than 2.6 wt. %.

78. The film of claim 77 wherein in the copolymers of the inner sealing layer and the outer layer the Mw/Mn is between 1.5 and 2.5.

79. The film of claim 77 wherein in the copolymers of the inner sealing layer and the outer layer the n-hexane extractables are less than 2 wt. %.

80. The film of claim 77 wherein in the copolymers of the inner sealing layer and the outer layer the n-hexane extractables are less than 1 wt. %.

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